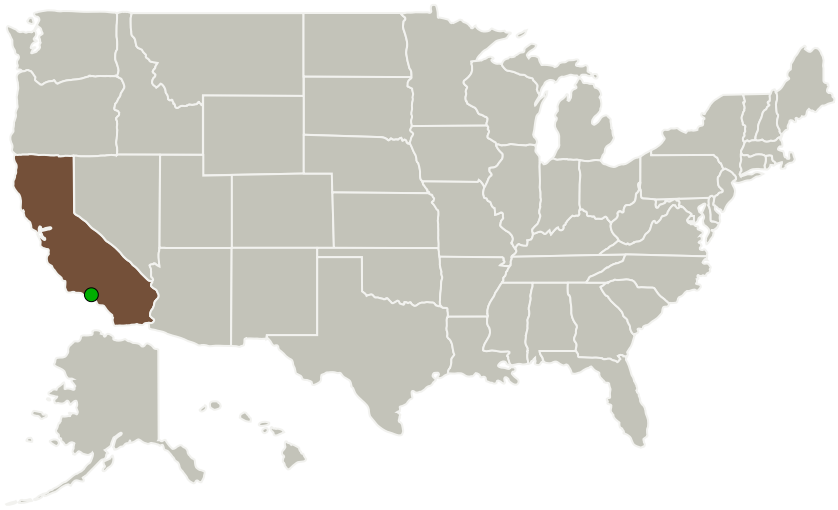
Novel Microfluidic Instrument for Spacecraft Environmental Monitoring, Phase I

Completed Technology Project (2012 - 2012)

Project Introduction

HJ Science & Technology, Inc. proposes to demonstrate the feasibility of an integrated "lab-on-a-chip" technology capable of in-situ, high throughput, and real time identification and characterization of a variety of toxic metals, organics, and bacteria biomarkers in spacecraft water supplies onboard the International Space Station. The novel technology combines automated programmable on-chip sample processing technology, microchip capillary electrophoresis, and laser induced fluorescence detection in a miniaturized format. In terms of spacecraft environmental monitoring, the in situ measurement capability of our portable platform offers important advantages including reduction in time and cost, real-time data for better and more timely decision making, and reduction in sample consumption. In addition to the unprecedented sensitivity, efficiency, selectivity, and throughput compared with the current state-of-the-art technologies, the proposed miniature instrument also meets the stringent space-flight requirements including small consumption of sample and reagent , low-mass, low–power consumption, rapid analysis time, and microgravity compatibility. In Phase I, we will establish the technical feasibility of the technology by analyzing fluorescently labeled ketones and aldehydes as a proof of principle demonstration. In Phase II, the main focus will direct towards the development of a miniaturized prototype to be delivered to NASA by incorporating the most promising design based on the results of Phase I as well including additional detection modules in order to extend the measurement and analysis capability to other contaminants relevant to spacecraft environmental monitoring.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
HJ Science & Technology, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Berkeley, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138377)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

HJ Science & Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Hong Jiao

Co-Investigator:

Hong Jiao

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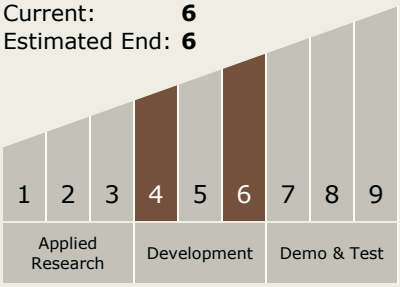
Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.4 Environmental Monitoring, Safety, and Emergency Response
    - TX06.4.1 Sensors: Air, Water, Microbial, and Acoustic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System